1B4A25226 (Pages : 3) Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fourth Semester B.Sc Statistics Degree Examination, April 2025

BST4B04 – Testing of Hypothesis

(2022Admission onwards)

Time: 2 ½ hours Max. Marks : 80

(Use of scientific calculator and statistical tables are permitted)

PART-A

[Each question carries 2 marks]

1. Define simple hypothesis
2. How will you decide the best critical regions of a Z test
3. Define Median test
4. Give the test statistic for testing the discrepancy between observed frequencies and expected frequencies
5. Define most powerful test
6. Give an instance where test for proportion is suitable
7. Discuss demerits of non parametric test
8. If the P(Type II error) in a testing procedure is 0.25, identify the power of the test
9. Complete the one way ANOVA table

Source of variation	Sum of squares	df	Mean sum of squares	F Ratio
Between samples	1567	2	-----	.....
Within samples	.....	.....	-----	
Total	1728	36		

10. A random sample of size 12 is taken from a normal population. To test whether the variance of the population is 4. If the sample variance is 6, find the value of the test statistic
11. Define run test and state the null hypothesis
12. What is a statistical hypothesis? Give an example
13. Define SPRT
14. Mention the test and test statistic employed for testing whether population mean has a specified value in case of large samples.
15. Define critical region

(Maximum Mark= 25)

PART-B

[Each question carries 5 marks]

16. The following result obtained on a study on vaccination against a disease

	Affected	Un affected
Vaccinated	12	26
Not vaccinated	16	6

Examine the effect of vaccine to control the disease at 5% level of significance

17. In a coin tossing experiment, let p be the probability of getting a head. A coin is tossed 12 times to test the hypothesis $H_0 : p = 0.5$ against the alternative $H_1 : p = 0.7$, where p is the probability of getting head when the coin is tossed. Reject H_0 if more than 8 heads tossed out of the 12 tosses. Find the significance level and power of the test.
18. Describe the paired sample t test
19. Explain the test for equality of variances of two normal populations
20. A random sample of 10 boys had the following I.Q's, 70, 120, 110, 101, 88, 83, 95, 98, 107, 100. Assuming that the population is normal, do these data support the assumptions that the population means IQ of 100?
21. Explain the test procedure for correlation coefficient.
22. Explain Wilcoxon signed rank test
23. The following are the average rainfall in mms over 40 consecutive days in a moderate rainy season 12, 15, 18, 20, 26, 24, 28, 32, 38, 48, 30, 28, 20, 36, 38, 40, 46, 50, 42, 40, 30, 22, 18, 16, 28, 30, 36, 44, 40, 52, 48, 38, 40, 26, 38, 42, 48, 38, 32, 30. Use one sample sign test to test whether the median rainfall is 40 mms against it is less than 40 at 5% level of significance.

(Maximum Mark= 35)

PART-C

[Each question carries 10 marks. Answer any Two Questions]

24. (a) Explain chi square test of goodness of fit

(b) A dice is tossed 120 times with the following result

Number shown	1	2	3	4	5	6
frequency	30	25	18	10	22	15

Test whether the dice is unbiased at 5% level of significance

25. (a) Define the test procedure for testing equality of proportions in two populations based on large samples

(b) In a sample of 600 men from a city 400 are found to be smokers. In 900 from another city 450 are smokers. Do the data indicate that the cities significantly differ as far as the smoking habits of people are concerned?

26. Explain non parametric test with their parametric counterpart and elaborate on their Advantages compared to parametric tests

27. Let x_1 and x_2 are two random sample taken from a population with p.d.f $f(x) = \frac{1}{\theta} e^{-\frac{x}{\theta}}$, $0 < x < \infty, \theta > 0$. To test $\theta = 2$ against $\theta = 4$, the critical region is $x_1 + x_2 \geq 9.5$. Obtain the significance level and power of the test.

(2x10= 20 Marks)

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fourth Semester B.Sc Mathematics Degree Examination, April 2025

BST4C04 – Statistical inference and Quality Control

(2022 Admission onwards)

Time: 2hours Max. Marks : 60

(Use of scientific calculator, statistical table , Non parametric table and control chart table are permitted)

PART A

Each question carries 2 Marks. Maximum Marks that can be scored in this part is 20

1. Define consistency.
2. State Cramer-Rao inequality.
3. The mean and standard deviation of sample of size 60 are $\bar{x}$ and s respectively. Write 95% confidence interval for the population mean.
4. Define simple and composite hypothesis.
5. What is the difference between null hypothesis and alternative hypothesis
6. Briefly explain paired t-test.
7. What do you mean by nonparametric test?
8. What are the assumptions of ANOVA technique?
9. Write any two advantages and disadvantages of nonparametric test?
10. Define Median test.
11. Define statistical quality control.
12. What are the control charts for variables?

PART B

Each question carries 5 marks. Maximum Marks that can be scored in this part is 30.

13. Show that the sample mean is sufficient for m when X ~PD(m)
14. Obtain the confidence interval for the variance of Normal population N (μ,σ) .
15. X~ B.D(10, p) Consider the following test for testing H_0: p=1/2 against H_1:p=1/4.Reject H_0 if $x \leq 2$ Find significance level and power of the test?
16. Explain the chi-square test of independence of two attributes
17. Explain Mann-Whitney U test.
18. Explain any five uses of statistical quality control.

19. During an examination of equal lengths of clothes, the following number of defects were observed 2, 3, 4, 0, 5, 6, 7, 4, 3, 2. Draw a control chart for the number of defects and state whether the process is under control?

PART C
Answer any one question and carries 10 Marks

20. Obtain maximum likelihood estimator for the population mean and variance of a normal population?

21. The following data present the number of units of production per day turned out by five different workers using four different types on machines.

Workers/ Machine type	A	B	C	D
1	44	38	47	36
2	46	40	52	43
3	34	36	44	32
4	43	38	46	33
5	38	42	49	39

a) Test whether the mean productivity is the same for the different machine types.

b) Test whether the five men differ with respect to mean productivity.

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fourth Semester B.Sc Statistics Degree Examination, April 2025

BAS4C04 – Probability Models and Risk Theory

(2022 Admission onwards)

Time: 2 hours Max. Marks : 60

(Use of statistical table, scientific calculator are permitted)

PART-A (Short Answer)
Each question carries *two* marks. Maximum 20 Marks

1. Explain the concept of a survival model.
2. What is expected future lifetime?
3. Define the force of mortality.
4. What is reinsurance?
5. Define excess of loss reinsurance.
6. What is proportional reinsurance?
7. Define collective risk model.
8. What are the general features of an insurance product?
9. What is a short-term insurance contract?
10. What is an aggregate claim distribution in reinsurance?
11. Define the individual risk model.
12. Define premium security loadings.

Maximum Marks = 20

PART-B (Paragraph)
Each question carries *five* marks. Maximum 30 Marks

13. A mortality table, which obeys Gompertz' Law for older ages, has:

    $\mu_{70} = 0.025330$ and $\mu_{90} = 0.126255$

    Calculate the probability that a life aged 60 will survive for 20 years.

14. If $\mu_x = 0.01908 + 0.001(x - 70)$ for $x \geq 55$, calculate ${}_5q_{60}$.

15. Claims from a particular portfolio have an exponential distribution with mean 1,000. The insurer takes out proportional reinsurance with a retained proportion of 0.9. Determine the distribution of the insurer's net claim amount random variable.

16. Suppose that claim amounts are uniformly distributed over the interval (0,500). The insurer effects individual excess of loss reinsurance with a retention limit of 375. Calculate the expected amounts paid by the insurer and the reinsurer in respect of a single claim.
17. Determine an expression for the MGF of the aggregate claim amount random variable if the number of claims has a *Bin*(100, 0.01) distribution and individual claim sizes have a *Gamma*(10, 0.2) distribution.
18. The distribution of the number of claims from a motor portfolio is negative binomial with parameters $k = 4{,}000$ and $p = 0.9$. The claim size distribution is Pareto with parameters $\alpha = 5$ and $\lambda = 1{,}200$. Calculate the mean and standard deviation of the aggregate claim distribution.
19. A portfolio of policies consists of one-year term assurances on 100 lives aged exactly 30 and 200 lives aged exactly 40. The probability of a claim during the year on any one of the lives is 0.0004 for the 30 year olds and 0.001 for the 40 year olds.
    If the sum assured on a life aged x is uniformly distributed between $1{,}000(x - 10)$ and $1{,}000(x+10)$, calculate the variance of the aggregate claims from this portfolio during the year (assuming that policies are independent with regard to claims).

Maximum Marks = 30

PART-C (Essay)

Each question carries *ten* marks. Maximum *10* Marks

20. a) Explain the main assumptions of collective risk model.
    b)Determine the mean, variance and MGF for compound negative binomial distribution.
21. a) Explain the concept of the surplus process in risk modeling.
    b)How is the probability of ruin calculated in continuous time?

(1 x 10 = 10 Marks)

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fourth Semester B.Sc Psychology Degree Examination, April 2025

BST4C08 – Statistical Techniques for Psychology

(2022Admission onwards)

Time: 2 hours Max. Marks : 60

(Use of scientific calculator , statistical table and Non parametric table are permitted)

SECTION A
Each question carries 2 Marks.
Maximum Marks that can be scored in this section is 20.

1. Define critical difference
2. What is a questionnaire
3. Write down the test statistic for a 2 X 2 contingency table
4. What are the assumptions of Wilcoxon's signed rank test
5. What are the advantages of a nonparametric test
6. What are factorial experiments
7. Give an example for 2^2 factorial design
8. What are the characteristics of a ratio scale
9. Define reliability
10. What is the difference between expected frequency and observed frequency in Chi-square tests
11. State the null and alternate hypothesis of one way ANOVA
12. When we use sign test

SECTION-B
Each question carries 5 Marks.
Maximum Marks that can be scored in this section is 30.

13. List down the guidelines of drafting a questionnaire
14. Briefly explain Kruskal-Wallis test
15. Explain different types of validity

16. A random sample of 395 people was surveyed and each person was asked to report the highest education level they obtained. The data that resulted from the survey are summarized in the following table:

	High School	Bachelors	Masters	Ph. D.	Total
Female	60	54	46	41	201
Male	40	44	53	57	194
Total	100	98	99	98	395

Is gender independent of education level?

17. Explain main effects and interactions in factorial experiment
18. How do we calculate critical difference for one way ANOVA
19. Explain the computational procedure of two way ANOVA.

SECTION-C
(Answer any one question and carries 10 marks)

20. Explain the analysis of a 2^2 design
21. A reputed marketing agency in India has three different training programs for its salesmen. The three programs are Method – A, B, C. To assess the success of the programs, 4 salesmen from each of the programs were sent to the field. Their performances in terms of sales are given in the following table.

Salesmen	Methods		
	A	B	C
1	4	6	2
2	6	10	6
3	5	7	4
4	7	5	4

Test whether there is significant difference among methods and among salesmen.